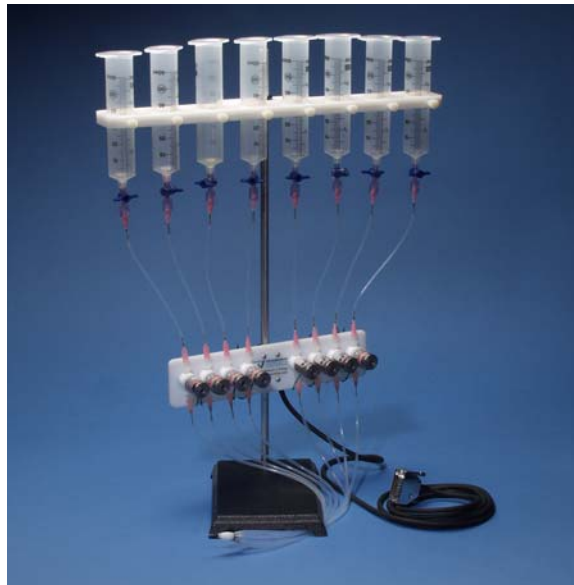


Warner Instruments
Perfusion Valve Controller
Model VC-8T



Warner Instruments
1125 Dixwell Avenue, Hamden, CT 06514
(800) 599-4203 / (203) 776-0664
(203) 776-1278 - fax



Table of Contents

SETUP.....	4
Components.....	4
Assembly.....	4
Overflow sensor	5
CONTROL DESCRIPTION.....	6
Front panel.....	6
<i>TTL Inputs</i>	<i>6</i>
<i>Command input toggle</i>	<i>7</i>
<i>Overflow</i>	<i>7</i>
Rear Panel	7
<i>Valves</i>	<i>7</i>
<i>Overflow In.....</i>	<i>8</i>
<i>Standby In.....</i>	<i>8</i>
<i>Ext Analog In.....</i>	<i>8</i>
<i>Event Out.....</i>	<i>8</i>
<i>Power input module</i>	<i>8</i>
INSTRUCTIONS FOR USE.....	9
Flow Adjustment	9
MAINTENANCE.....	9
Cleaning.....	9
APPENDIX.....	10
Warranty	10
Specifications.....	11
Certifications.....	12

The **VC-8T** Valve Control System lies at the heart of a multi-valve perfusion system designed to automate and control the delivery of solutions to Warner Instruments imaging and recording chambers. However, its flexible design allows the **VC-8T** to be used in many applications not using Warner equipment.

Features include:

- ✓ **8 channel individually controlled channels**
- ✓ **PTFE valves**
- ✓ **Spill sensor**
- ✓ **Manual and computer control**

The complete system includes a valve controller, a valve bracket with PTFE valves, connecting cable, an **MPP-8** manifold, a support stand, syringe holder, eight 60 cc syringes, 25 feet of PTFE tubing, 10 feet of **PE-160**, 24 blunt-end 18-gauge syringe needles, and 8 stopcocks.

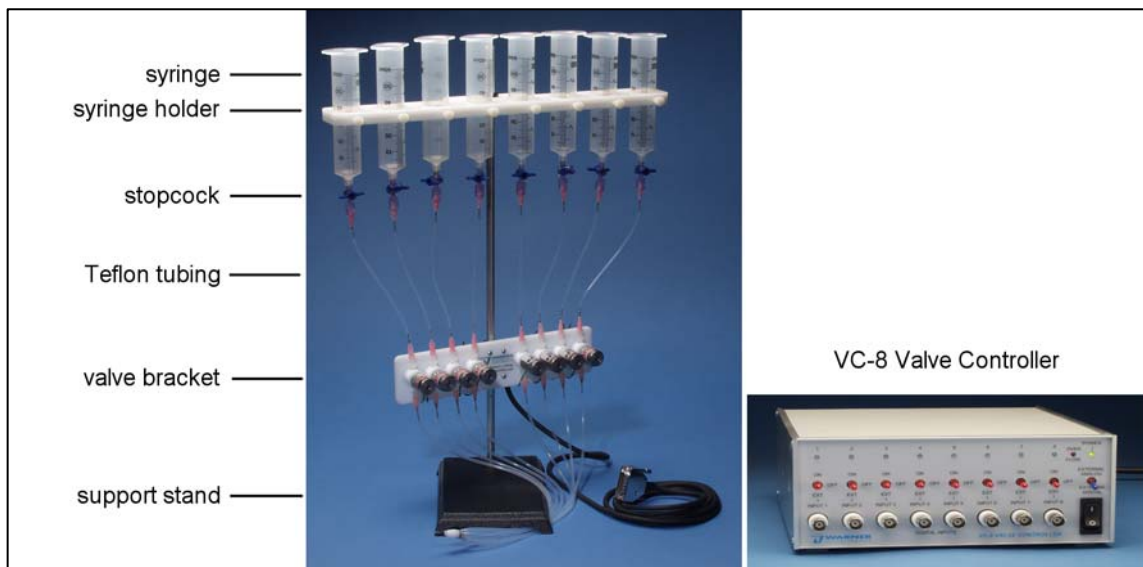
A new and exciting feature to the **VC-8** Valve Control System is the **Spill Sensor Probe**. This probe is used to detect the presence of an overflow condition and, when activated, will automatically shut off all valves protecting your microscope optics.

The controller can independently regulate the function of up to eight valves. Individual valves can be controlled via manual switch, an external analog signal or an external digital (TTL) signal. An event marker pulse, generated each time a valve is switched on, is provided at the rear of the instrument for recording into your acquisition system. Valve transitions (opened or closed) occur at full power to insure rapid response times and are then held in place at less than half power to prevent heat transfer to solutions.

SETUP

Components

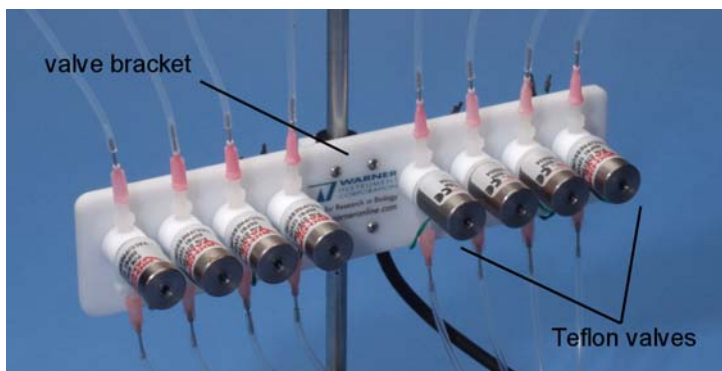
Before beginning setup, take inventory of the supplied components. You should have a valve bracket with included PTFE valves, a syringe holder, support stand, blunt-end syringe needles (24), stopcocks (8), PTFE tubing (25 ft), **PE-160** tubing (10 ft), an **MPP 8-port manifold**, and a **VC-8 Valve Controller**.



The **VC-8T** is designed to operate as a *stopped-flow* device wherein the valve for each channel is either open (allowing solution to flow) or is closed. In general, the shortest response time for delivery of the selected solution will be achieved by keeping the tubing length between the MANIFOLD and sample as short as possible.

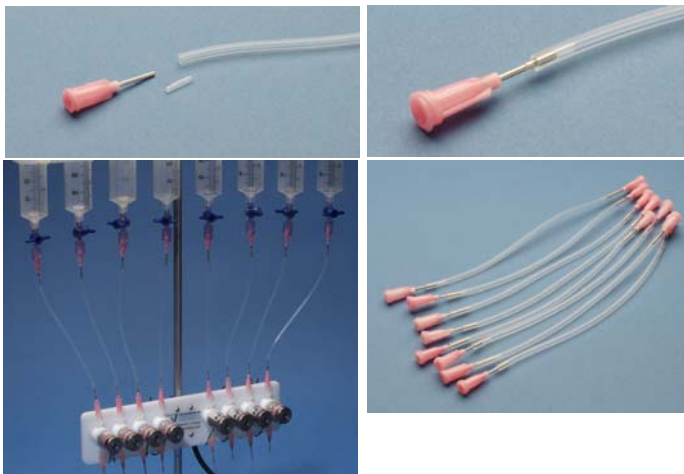
Assembly

1. Begin assembly of the **VC-8T** by first attaching the VALVE BRACKET to the SUPPORT STAND. Place the VALVE BRACKET near the base of the SUPPORT STAND as shown above.
2. This is followed by attaching the SYRINGE HOLDER to the top of the SUPPORT STAND. Place the SYRINGE HOLDER near the top of the SUPPORT STAND as shown above.
3. Remove the plungers from the eight supplied 60 cc syringes and place syringes into the SYRINGE HOLDER. Attach STOPCOCKS to each syringe.



4. Cut eight (8) pieces of PTFE tubing long enough to run from the stopcocks to the *input ports* on the PTFE valves.

5. Attach one (1) blunt-end, 18-gauge syringe needle to both ends of each length of PTFE tubing to provide Luer connection points. Insert a short section of **PE-160** onto the needle tip to facilitate a tight seal between the PTFE tubing and the syringe needle.



6. Using the Luer-ended PTFE tubes formed in step 5, make a connection between the stopcock on each syringe to the associated *input port* on each PTFE valve. Proper tubing lengths, Luer connector attachments, and tubing placements are shown in the montage above.

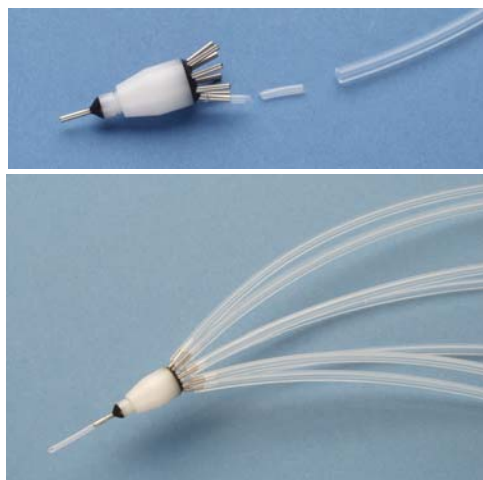
7. Cut eight (8) pieces of PTFE tubing to run from the *output ports* of the PTFE valve to the supplied **MPP** manifold. The tubing length needed is left to the discretion of the user but should be sufficient to allow a short connection between the manifold and the sample chamber.

8. Attach the remaining blunt-end syringe needles to each piece of PTFE tubing.

9. Prepare the **MPP** manifold to accept the PTFE tubing by first sliding a short length of **PE-160** tubing over the *input ports* on the **MPP** manifold.

10. Now make a connection between the *output port* on each PTFE valve and one *input port* on the **MPP** manifold.

11. Run a short length of **PE-160** tubing from the *output port* on the **MPP** manifold to the *input port* of sample chamber.



NOTE: If desired, you can also run PTFE tubing between the manifold and your chamber. Prepare the manifold to accept the PTFE tubing by first sliding a short length of **PE-160** tubing over the output port on the **MPP** manifold.

12. Finally, connect the VALVE MANIFOLD to the **VC-8** CONTROLLER using the attached cable.

Overflow sensor

The **VC-8T** Valve Control System includes a unique overflow or spill sensor designed to assist you in providing a level of protection to your microscope. The sensor itself is a small

Ag/AgCl probe which grounds through the chamber bath. A resistance of 10 M Ω or less between the probe and ground will trigger the overflow circuitry.

Place the probe adjacent your perfusion chamber such that the maximum solution height (say, just prior to an actual overflow) is achieved when the solution contacts the tip of the probe. Contact between the probe and your solution will activate the overflow circuitry and close all the valves. The OVERFLOW SENSOR plugs into the OVERFLOW IN BNC on the rear of the controller.

CONTROL DESCRIPTION

Front panel

The front panel of the **VC-8 Valve Controller** contains TTL inputs for each valve, an associated 3-position toggle switch for manually setting the state of each valve and an LED displaying the active status for each valve. There is also a 2-position toggle switch for selecting the *command input mode*, a SPILL SENSOR indicator, and a power switch with power on LED.



TTL Inputs

TTL inputs (front panel BNC's and ON/OFF TOGGLE SWITCHES) are provided for all 8 channels of the **VC-8 Controller**. Operation of the front panel TTL inputs is selected by placing the 2 position COMMAND INPUT TOGGLE into *external digital* mode. Use of these inputs can allow the opening of more than one valve at the same time from a digital source such as your computer.

Placing the ON/OFF TOGGLE SWITCH into the *on* position places the associated valve into its open state. A lit LED indicates the open state of the valve. This setting is overridden by the overflow sensor.

Placing the ON/OFF TOGGLE SWITCH into the *off* position places the valve into its closed state. An unlit LED indicates the closed state of the valve.

Placing the ON/OFF TOGGLE SWITCH into the *ext* position activates the associated BNC inputs. A logic level *low* (0 V) applied to the BNC places the associated valve into the *closed* state. Correspondingly, a logic level *high* (3-5 V) places the associated valve into the *open* state. A lit and an unlit LED indicates the open and closed states of the valve, respectively. These settings can be overridden by the overflow sensor.

Command input toggle

The COMMAND INPUT TOGGLE is used to select between the front panel *external digital* controls and the rear panel *external analog* controls.

Overflow

The OVERFLOW LED indicates an overflow condition sensed by the OVERFLOW SENSOR. Activation of this circuit by an overflow condition immediately overrides all other settings and closes all valves.

Rear Panel

The rear panel contains the power input module with fuse, a 15 pin D-connector for the VALVE SET, and 4 BNC connections for OVERFLOW IN, STANDBY IN, EXT ANALOG IN and EVENT OUT.



Valves

A 15 pin, "D" type female connector is used to connect the cable from the VALVE BRACKET to the CONTROLLER.

Overflow In

This BNC is used to connect the OVERFLOW SENSOR to the controller. Place the sensor into position and plug it into this BNC.

Standby In

This BNC is provided to allow the placing of the VALVE CONTROLLER into *standby mode*. *Standby mode* disables EXT ANALOG IN inputs and closes all valves.

Activation of this input is selected by placing the FRONT PANEL COMMAND input toggle into *external analog* mode and a TTL level *high* (3-5 V) places the instrument in *standby*.

Ext Analog In

This BNC is used to operate valves using analog voltage settings. The voltage applied to this input selects the valve to open. All other vales are closed. Switching voltages closes the open valve and open the other. Valve selections are overridden by the OVERFLOW SENSOR and the STANDBY BNC.

The table below indicates the selection scheme.

Applied voltage (V)	Valve selection
0	standby
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

Event Out

The Event Marker output produces a 500 ms logic-level output (+5 V) each time a valve is turned on. At all other times the Event Marker output is low (0 V).

Power input module

A polarized, 3-conductor, IEC320/CEE-22 connector is used for line (mains) power input to the instrument. A removable cordset, terminated with a NEMA 5-15P connector, is standard.

A fuse holder contains a protective fuse in series with the high side (brown or black wire) of the mains. The holder accepts 5 x 20 mm fuses of the type indicated.

INSTRUCTIONS FOR USE

Flow Adjustment

Flow rates can be adjusted by raising or lowering the reservoir holder, as well as by adjusting the height of each reservoir within the holder.

The table below lists the approximate flow rates for a reservoir at the specified height with the supplied PTFE tubing.

Reservoir height	Approximate flow rate
61 cm (24 in.)	14 ml/min
30 cm (12 in.)	9 ml/min
20 cm (8 in.)	5 ml/min

MAINTENANCE

Cleaning

Do not use alcohol, aromatic hydrocarbons or chlorinated solvents for cleaning. They may adversely react with the plastic materials used to manufacture the system. If salt solution spills on the valve assembly it should be cleaned as soon as possible with a soft cloth dampened with a mild solution of detergent and water.

NOTE: PTFE Valves must be completely flushed with distilled water after each use. Permanent damage will result if saline solution is allowed to crystallize inside the valve.

The exterior of the CONTROLLER may be cleaned periodically to remove dust, grease and other contamination. It is not necessary to clean the inside. Use a soft cloth dampened with a mild solution of detergent and water. Avoid abrasive cleaners.

APPENDIX

Warranty

The **VC-8T Valve Control System** is warranted to be free from defects in materials and workmanship for a period of two years from the date of shipment. If a failure occurs within this period, we will repair or replace the faulty component(s) at our discretion. This warranty does not cover failure or damage caused by physical abuse or electrical stress (e.g., exceeding specified input limits).

Shipping charges to the factory are the customer's responsibility. Return shipping of the repaired unit will be paid by Warner Instruments, Inc.

Specifications

Valve Bracket	Delrin. Mounts on 3/8" or 1/2" ring stand
Valves	PTFE, 12 VDC /0.25 A to maintain pinch
Connection Cable	2.4 meter (8 ft.) connecting cable terminated with quick disconnects on valve end and 15 pin male "D" type connector on controller end.
Tubing	PTFE, 1/8 OD x 1/16 ID
Reservoirs	60 cc capacity syringes
Reservoir Holder	Delrin. Holds eight syringes with thumb screws for each reservoir.
Valve Controller (front panel)	
Power	Two position on/off with power-on LED
Input Select	Two position selecting analog or digital inputs
Switch Selection	<i>On (manual), Off or External</i>
External Input	+5 V TTL-compatible (BNC Connector)
Overflow	LED indicating overflow condition
Valve Controller (rear panel)	
Overflow In	BNC connection to OVERFLOW SENSOR. Triggered when sensed resistance falls below 10 M Ω .
Standby In	BNC connection to activate <i>standby mode</i> . TTL <i>high</i> closes all valves.
Ext Analog In	BNC connection for valve selection. Active valve opened by analog voltage.
Event Marker	Logic level pulse 500 ms nominal (BNC connector)
Manifold	8/1, nominal dead space
Power	110-130 or 200-250 VAC, single-phase, 50/60 Hz, 20 watt
Operating Temperature	10-40° C (50-104° F)
Dimensions (H x W x D)	89 x 203 x 305 mm (3.5 x 8.0 x 12 in.)
Weight / Shipping Weight	3.7 kg (8 lb.) / 4.6 kg (10 lb.)
Operating conditions	
Equipment is intended to be operated in a controlled laboratory environment.	Temperature: 0-40 °C Altitude: sea level to 2000 m Relative humidity: 0-95%

Certifications

Declaration of Conformity
CE MARKING (EMC)

Application of Council Directive: 89/336/EEC

Standards To Which Conformity
Is Declared:

EN55022 Class A
EN61000-3-2
EN61000-3-3
EN50082-1:1992
EN61000-4-2
EN61000-4-3
ENV50204
EN610000-4-4
EN610000-4-8
EN610000-4-11

Manufacturer's Name:

Warner Instruments, LLC

Manufacturer's Address:

1125 Dixwell Avenue
Hamden, CT 06514
Tel: (203) 776-0664

Equipment Description:

Valve Controller

Equipment Class:

ITE-Class A

Model Numbers:

VC-8 Controller

***I the undersigned, hereby declare that the equipment specified
above, conforms to the above Directive(s) and Standard(s).***

Place: Hamden, Connecticut USA

Signature:



Full Name: Burton J. Warner

Position: President

Declaration of Conformity
CE MARKING (LVD)

Application of Council Directive: 73/23/EEC

Standards To Which Conformity Is
Declared:

EN61010-1:1993

Manufacturer's Name:

Warner Instruments, LLC

Manufacturer's Address:

1125 Dixwell Avenue
Hamden, CT 06514
Tel: (203) 776-0664

Equipment Description:

Valve Controller
Safety requirements for electrical
equipment for measurement and
laboratory use

Equipment Class:

Class I

Model Numbers:

VC-8 Controller

***I the undersigned, hereby declare that the equipment specified
above, conforms to the above Directive(s) and Standard(s).***

Place: Hamden, Connecticut USA

Signature:



Full Name: Burton J. Warner

Position: President

WEEE/RoHS Compliance Statement

EU Directives WEEE and RoHS

To Our Valued Customers:

Harvard Apparatus is committed to being a good corporate citizen. As part of that commitment, we strive to maintain an environmentally conscious manufacturing operation. The European Union (EU) has enacted two Directives, the first on product recycling (Waste Electrical and Electronic Equipment, WEEE) and the second limiting the use of certain substances (Restriction on the use of Hazardous Substances, RoHS). Over time, these Directives will be implemented in the national laws of each EU Member State.

Once the final national regulations have been put into place, recycling will be offered for those Harvard Apparatus products which are within the scope of the WEEE Directive. Products falling under the scope of the WEEE Directive available for sale after August 13, 2005 will be identified with a "wheelie bin" symbol.

Two Categories of products covered by the WEEE Directive are currently exempt from the RoHS Directive – Category 8, medical devices (with the exception of implanted or infected products) and Category 9, monitoring and control instruments. Most of Harvard Apparatus' products fall into either Category 8 or 9 and are currently exempt from the RoHS Directive. Harvard Apparatus will continue to monitor the application of the RoHS Directive to its products and will comply with any changes as they apply.



- Do Not Dispose Product with Municipal Waste.
- Special Collection/Disposal Required.